In one respect this task has presented difficulties of a peculiar nature, due to the fact that our country has taken a leading part in developing the principles of energy—this science has in fact grown here, and the terminology has grown with it. At the present moment there is no man of science who speaks of the forces when he means the energies of nature, but there is a lagging behind in this respect amongst the body of the people, to whom the word force is a familiar one, and the word energy, in a scientific sense, very much the reverse. Accordingly one of the first duties of the author has been to define the exact relations between force and energy in a way suitable to his audience—a task which he has successfully achieved.

While in respect of importance the science of energy holds a paramount place, it is also a subject which lends itself admirably to the mode of treatment adopted by the author of this volume. Probably no subject is more difficult of conception on general principles merely, and without reference to the actualities of life. The philosopher in his study may have but a vague conception of these general laws, and his assent to the definition of work may be purely intellectual. Perhaps he may never have witnessed a well marked case of the transmutation of energy, nor may he have the consciousness that he himself is frequently the subject of such transmutations. The artisan is, however, in a totally different position. After a day's hard toil he is well able to realise in a very vivid manner the meaning of the word *work*. To spend his personal physical energy, and to recruit it by food, are operations in which he is constantly and consciously engaged. Hence it follows that a theory which borrows all these facts as illustrations of its truth appeals to the artisan in a much more emphatic way than it does to the mere student of science. To use the scientific terminology, the latter may have more *kinetic* intellectuality than the former, but the artisan is in a *position of advantage* which enables him to grasp the truths of the science. A book, therefore, which, like the present, abounds in good illustrations and in clear and simple statements, carrying practical applications, is one peculiarly fitted to a class better qualified by education and experience to perceive the concrete than to appreciate abstract general principles.
B. S.

Journal of the Royal Agricultural Society. Second Series, Part II. Vol. XIX. October, 1883. Price 6*s*. (London: John Murray.)

THE current number of the *Journal of the Royal Agricultural Society* has just reached us. It fully maintains the reputation so justly earned by previous numbers, and contains papers on many topics of present interest to agriculturists. Among the principal of these may be mentioned "The Progress of Fruit-Farming," by Mr. Whitehead, of Barming House, Kent, himself largely interested in this business. The continued reports upon Prize Farms are worthy of attention as showing what is being done on the best farms in various districts. A report on sheep-feeding experiments conducted at Woburn by Dr. Voelcker in his capacity of chemist to the Society, and a report on wheat mildew, by Mr. W. C. Little, of Stag's Holl, form the chief attractions to practical farmers. Among the more purely scientific or speculative contents may be mentioned a contribution from Rothamsted, by Sir John Lawes and his able coadjutor, Dr. Gilbert, upon the composition of drainage water collected at Rothamsted, and a valuable paper upon nitrogen as nitric acid in the soils and subsoils of certain fields on the same estate. The remainder of the volume is chiefly occupied with useful official matter, such as the Weather Report; the Botanical Report, by Mr. Carruthers; and Reports on Live Stock, Implements, &c., exhibited at York. A touching tribute is paid to the memory of a late president of the Society, the late Lord Vernon, by Mr. Wells, himself an ex-president. Perhaps the most striking and instructive paper is that by Mr. Thomas Bell upon the Yorkshire Prize Competition, containing a full report of the Tuyers Wood and East Park Farms, occupied by Mr. Turnbull. In these days, when dairying is justly attracting very special attention, it is highly interesting to receive sound information as to the methods used on thoroughly well-managed farms. A daily record of the milk yielded by each cow in a dairy containing 100 animals in milk is in itself highly useful, and worthy of imitation. It is impossible in a short notice like the present to open up the various topics dealt with. It has ever been the wise policy of the "Royal Agriculturist" to fill its pages with contributions from specialists upon their own specialities. There is no padding or superfluous discursiveness, and sometimes to the uninitiated there may appear to be a want of that introductory and explanatory matter which entices on the general reader. As a record of agricultural research and progress, the journal holds a high position, which the number just issued fully maintains.
J. W.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

On Chepstow Railway Bridge, with General Remarks suggested by that Structure

IN a letter to NATURE of some months past, suggested by a special subject of engineering, I pointed out the necessity of clearly understanding the effects of endwise pressure on metallic columns, in respect of its tendency to cause springing or buckling of the columns. I remarked that there is a total want of experiments on the subject (Mr. Hodgkinson's observations, made on a very small scale, being excepted), and I gave some details of a theory by which the effective arrangement of such experiments might perhaps be facilitated. I have lately observed in an engineering work a failure of a different class arising from endwise pressure, of a kind which I had not anticipated, and which appears to be perhaps more dangerous than even the buckling to which I had called attention.

In the neighbourhood of Chepstow, the River Wye is crossed by a railway bridge of a single span. The four corners of the bridge are supported by iron tubular vertical, columns of considerable length. One of these columns (on the Monmouthshire side of the river, and on the lower side of the bridge as regards the course of the river) is split, with several important longitudinal fissures. To avert the present destruction of the bridge, strong iron hoops have been placed surrounding this tube, drawn tight by screws and nuts, exhibiting a somewhat unsightly appearance.

For clear understanding of this state, the reader may figure to himself a cask or barrel, set on its end, and loaded on the top till its staves burst outwards; then he must conceive a hoop to be placed round the body of the cask, and drawn till the edges of the staves are wholly or nearly in contact.

I do not doubt that this column is now safe. But there are other columns supporting the bridge which are exposed to the same dangers: the bridge is heavy, the loads from the Taff and the Tawe are not light, and the jar of ponderous locomotives may try every original weak point or may create new ones; and I think it would be well provisionally to encircle the other supporting columns in the same way as the one which has failed.

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A symmetrical system of rings, with some attention to simple elegance, would remove the offensive effect produced by the bent bars of mere blacksmith's work which now surround a single column.

But it is not specially to the state of the Chepstow Bridge that I wish to call the attention of the public. It is to the total want of practical knowledge as to the enduring power of metals, with which this bridge was built, and with which other such bridges must at present be built. We are totally without experiment on the danger of springing or buckling, and on the danger of bursting (now, I believe, for the first time brought forward). And we might perhaps consider such experiments as well falling within the province of those organised bodies whose union is based on the promotion of the most important determinations in civil engineering.

The Institution of Civil Engineers (with which body I have a much-valued honorary connection) has lately departed in some measure from the strict subject of engineering to which its attention had been successfully given for so many years. I venture to suggest that this body might well take up the conduct of experiments bearing on engineering. The examination of the effects of force in mere crushing of external surfaces has been admirably prosecuted by American engineers. But the examination of bending and bursting, as the effects of end-pressure, is still open to the engineers of Britain. The funds of the Institution appear to be amply sufficient for such purposes, and the undertaking of them would undoubtedly be considered as honourable to the body.

G. B. Airy

The White House, Greenwich, November 17

Physiology in Oxford

A paragraph appeared in the *Spectator* of Saturday, the 10th inst., on the Oxford memorial concerning the University Physiological Laboratory. That part of it which affects Magdalen College appears to me to rest upon erroneous information, and is certainly calculated to spread an entirely false and misleading impression of the attitude of this College in the matter, and of the University in general.

If you will allow me to quote the paragraph, and at the same time give you the actual facts, I think you will easily form an opinion on the real state of the case.

The paragraph states that the signatures were received "from members in Oxford and its suburbs, and the rest from a circle of about fifteen miles round."

The fact is that the signatures are not drawn exclusively from either the smaller or even the larger area, one of the so-called Magdalen signatures being that of a member of the Hereford Cathedral choir.

The paragraph goes on to say:—" We are told that Magdalen men have signed it more numerously than any other College but one, and, in proportion to the size of the College, more numerously than any. Now, as Prof. Burdon Sanderson is *ex officio* a Fellow of Magdalen, and as Magdalen has for years past had a physiological laboratory of its own, this popularity of the memorial among Magdalen men is highly significant."

On this I have to remark that the signatures are representative neither of the governing body of the College, nor of its resident members.

The governing body of the College consists of the President and twenty-four Fellows; of these twenty-five *three alone have signed the memorial*. The resident members, as shown by the list of congregation, number twenty-two; of these twenty-two *only six* have signed.

Finally, as regards the last paragraph, it is true that Magdalen College has for years past had a physiological laboratory of its own, and it is further true that the University teaching of physiology has been carried on there, previous to the advent of Dr. Burdon Sanderson, for years past under a Government licence with the full and express consent of the whole governing body of the College, a fact which is indeed significant, but hardly in the way in which the *Spectator* appears to have been informed.

Edward Chapman

Magdalen College, Oxford, November 15

Green Sunlight

Mr. G. H. Hopkins' observation that the parting ray at sunset is sometimes brilliant emerald-green brings to my memory a somewhat similar experience. On September 13, 1865, watching on the summit of the Rigi for sunrise, I caught the very first possible glimpse of the sun's disk as, on a very clear morning, he emerged from behind the sharply-defined outline of a distant mountain. The very first rays, although necessarily proceeding from the comparatively obscure limb of the sun, were dazzlingly brilliant, and of a superb emerald green colour. But almost instantly, as more of the sun appeared and his light grew sensibly more intense, the green passed away or was merged in the yellowish white of ordinary sunlight.

In my case I do not doubt the phenomenon was purely subjective, for before sunrise the sky was all lit up of a magnificent crimson hue. Every one must have noted how the moon when surrounded with bright crimson clouds looks more or less decidedly green.

A very striking effect of this sort, like the others an example of the well-known visual phenomenon of "accidental colours," may be artificially obtained, any time the moon shines, by burning an ordinary "blue" signal light. After my eye had been intensely excited by such a light close at hand, I have seen the moon, near or at its full, of a deep plum colour, by which I mean the colour of the bloom on a black plum or on a well coloured Hamburg grape. Or, in place of these, the *violet* of my friend Prof. Piazzi Smyth's exquisite chart of colours in his "Madeira Spectroscopic," or the *bleu violet* of Chevreul's chromatic circle. I recommend the experiment as easy of performance and exceedingly beautiful in its effects. Possibly a small blue light would suffice. But, on the occasion to which I have referred, certainly not less than thirty ounces of nitre, ten of sulphur, and five of black antimony sulphide were employed. These, mixed in fine powder, may be burned in a case about six inches high and four in diameter; of course in the open air, and where no mischief may accrue from an intensely hot and voluminous flame.

In a communication made to the Royal Society of Edinburgh in 1852 (*Trans.* vol. xx. pp. 445–471), I adduced evidence to prove that a continuous thin layer surrounds the sun's photosphere, of which upturned portions form the red protuberances seen at total solar eclipses; and I then showed that if the well known darkening of the sun's limb be due to absorption in his atmosphere, it can only be caused by such a *thin* envelope. The existence of this envelope, the sun's chromosphere, is now fully established. If, from the red colour of its upper portions, we may infer the resultant tint emitted by the whole to be red, then, by a well known law, the discolouration of the sun's limb due to its absorption should be of a greenish hue. But such an effect would necessarily be but slight, and could not explain the brilliant green witnessed on the Rigi. Nor do I recollect any instance where the first emerging rays of the photosphere at the end of a total eclipse have been observed to be green.

William Swan

Ardchapel, Dumbartonshire, November 8

A letter from Barinas, Venezuela, states that on September 2, from daylight until noon, and from 3 p.m. to sundown, the sun appeared like a globe of burnished silver. Between noon and three o'clock it was of a bluish-green colour. This appearance in the western hemisphere seems to dispose of the suggestion of the Java eruptions as the cause of green suns in India.

Hyde Clarke

Mangrove as a Destructive Agent

As I have never seen the mangrove mentioned but as a conservative or productive agent as regards geological change, it may be interesting to readers of Nature to hear of its acting in a contrary direction.

In several parts of eastern tropical Africa, where the shores are mostly of upraised coral limestone, I have noticed the effect of mangrove in eating away this rock, but nowhere have I seen it so well marked as in the Island of Aldabra, some two hundred miles to the north-west of Madagascar, and which I surveyed in 1878.

Aldabra is an upraised atoll about twenty-two miles long, and presents low cliffs of about fifteen to twenty feet of solid coral rock to the sea and also to the lagoon, which is, at low water, nearly dry

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